Question Paper

Exam Date & Time: 14-Nov-2018 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
THIRD SEMESTER B.SC. Applied Sciences in Engg.
END - SEMESTER THEORY EXAMINATIONS NOVEMBER - 2018

BASIC REINFORCED CONCRETE DESIGN [ICE 231]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

Missing data may be suitably assumed.

Usage of IS: 456 -2000 and SP-16 are permitted.

1) A) A reinforced concrete beam of 230 mm wide and an effective depth of 500 mm is reinforced with 4 bars of 16 mm diameter on tension side. Use M25 grade concrete and Fe415 grade steel, calculate the moment of resistance of the section. (Use working stress method) (10)

B) Calculate the maximum stresses in concrete and steel if a beam of 300 mm wide and 550 mm effective depth is reinforced with 3 bars of 25 mm diameter on tension side and is subjected to a bending moment of 55 kN-m. Also state whether the section is under reinforced or over reinforced. The beam is made up of M25 grade concrete and Fe415 grade steel. (Use working stress method) (10)

2) A) A beam has 300 mm x 500 mm overall cross section. Calculate the area of steel required, if the bending moment induced for a working load is 200 kN-m. Consider an effective cover of 40 mm for both tension and compression reinforcements. Consider 12 mm diameter bars as compression reinforcement and 25 mm diameter bars for tension reinforcement. Use M30 grade concrete and Fe415 steel. (Use Limit state method) (10)

B) A simply supported beam with cross section 230 mm wide and 600 mm overal depth is reinforced with 4 bars of 16 mm diameter on the tension side with an effective cover of 50mm. Calculate the safe UDL including the self-weight over an effective span of 4m. The materials used are M25 (10)

grade concrete and Fe415 grade steel. (Use Limit state method)

3) Design the end span of a continuous beam having an effective span of 5m carrying a factored dead load of 30kN/m and factored live load of 18kN/m. Carryout all the necessary checks as per IS: 456 2000. The grade of concrete is M20 and grade of steel is Fe415, the beam is located in mild exposure condition. Assume breadth of beam as 250mm. (Use Limit state method) (20)

4) Design a cantilever beam to carry a working load of 30kN/m inclusive of its self-weight over an effective span of 2.5m, the width of the beam is 230mm, grade of concrete is M25 and grade of steel is Fe415. Adopt effective cover as 40mm. (Use Limit state method) (20)

5) Design a slab over a room of size 3.5mx6.5m to carry a LL of 2.5kN/m^2 and DL due to FF 1kN/m^2.The slab is simply supported over all the 4 edges and the corners are not restrained against lifting. Adopt M25 grade of concrete and Fe 415 steel exposure condition is moderate, support width of the wall is 230mm. Carryout all necessary checks as per IS 456-2000. (Use Limit state method) (20)

6) Explain the classification of the columns with neat sketch (8)

A)

B) Design for an axially loaded column with uniaxial bending moment, the dimensions of the column is 230mmx500mm. The factored axial load on the column is 1800kN and factored uniaxial bending moment of 150 kN-m about major axis, grade of concrete is M40 and grade of steel is Fe 415. Consider an effective cover of 40 mm. (Use Limit state method) (12)

7) Check the adequacy of the column of size 350mmx600mm subjected to factored axial load of 1750kN and factored bending moment about major axis of 200kN-m and about minor axis 95kN-m. Adopt grade of concrete M25 and grade of steel Fe415. Consider clear cover as 40mm. (Use Limit state method) (20)

8) (14)

A) A simply supported rectangular beam section 300mmx450mm overall depth is reinforced with 4 bars of 20mm diameter as main reinforcement on tension side.

The beam has an effective span of 6m which supports total load (DL+LL) of 20kN/m inclusive of self-weight. Assuming M30 concrete and Fe415 steel, calculate short term deflection at midspan. Assume an effective cover of 40mm, Es = 200GPa (Use working stress method).

B) Explain briefly any two types of footings with neat sketch (6)

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